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TU Plans SPE Sponsored Petroleum Engineering Centennial Symposium

1994 represents the Centennial year for The University of Tulsa. A year-long celebration from October, 1993, to October, 1994 will feature a variety of Centennial events. As the flagship department at The University of Tulsa, the Petroleum Engineering Department will sponsor a high technology symposium featuring technical papers on topics in which The University of Tulsa has established research programs. The Society of Petroleum Engineers has agreed to co-sponsor this important event and the dates of August 29 - 31 have been selected.

Dr. Kermit Brown, Professor Emeritus of Petroleum Engineering at The University of Tulsa, will serve as Honorary Chairman of the symposium. A steering committee

chaired by Dr. James P. Brill has been established to coordinate the Centennial Symposium. Dr. Brill is joined by Dr. Stefan Miska and Dr. Mohan Kelkar as executive members of the Steering Committee. Also serving on the Steering Committee are: Dr. Ram Agarwal, Amoco Production Company; Dr. Michael Fetkovich, retired from Phillips Petroleum Company; Dr. E.T. Guerrero, Professor Emeritus; Ms. Amanda Jones, Oxy, U.S.A.; Dr. Ken Nolte, Dowell Schlumberger; Mr. Tommy Warren, Amoco Production Company; and Mr. Jack Zarrow, Sooner Pipe and Supply.

The symposium will feature two concurrent technical sessions on

Continued on page 2.



Steering committee meets to plan the Centennial Symposium.

TUFFP Talk continued from page 1.

Tuesday and Wednesday mornings and afternoons with approximately 40 invited technical papers solicited by the session co-chairs. Technical sessions will feature articles on the subjects of: two-phase flow through pipes, drilling, artificial lift, reservoir characterization, reservoir engineering, well completion/stimulation, well testing and production. Papers will be international in scope and concentrate on the latest state-of-the-art technology in these subject areas. TUFFP member companies are urged to place this important event on their calendars and advertise it among their engineers and scientists.

The first day of the symposium will feature a plenary session chaired by Dr. Lowell Smith, Manager of Research for Amoco Production Company, and Dr. Brill. The topic of the plenary session will be Research and Development needs for the Petroleum Industry in the 21st century and may involve participants from the U.S. Government, foreign research centers, major and independent oil companies, service companies, and consultants. Also included on August 29 will be tours of The University of Tulsa Main Campus and of experimental research facilities on the North Campus.

Yehuda Taitel Returns to TUFFP



Dr. Yehuda Taitel is currently spending a period of six weeks at TUFFP as a consultant on a variety of research projects. Once again, he is lending his unique expertise to assisting TUFFP researchers in their modeling problems and design of experimental test facilities. In addition, he is working on preparing or modifying publications based on past TUFFP research projects.

BHRG Plans North America Conference on Multiphase Production

The first BHRG sponsored conference on multiphase production ever held in North America is scheduled for September 6 - 8, 1994, in Banff Springs, Canada. Co-sponsors for the event include NeoTechnology, Inc. and TUFFP. Additional sponsorship is also being sought by the Society of Petroleum Engineers. A call for papers for the meeting will be issued later this fall. As in past meetings in Europe, this conference will focus specifically on multiphase flow research, application, and equipment oriented topics specifically dealing with the petroleum industry. TUFFP members are urged to both submit papers and attend this exciting conference.

Third Post Doctoral Research Associate Arrives at TUFFP

Dr. Xuanzheng (Tom) Chen arrived from China on April 27, 1993, to fill a third Post Doctoral Research Associate position in TUFFP. Dr. Chen has B.S., M.S., and Ph.D. degrees in Thermal Energy Engineering from Xi'an Jiaotong University in China. He has conducted extensive research and published in the areas of oil-water, oil-gas-water, and high pressure steam-water flow in pipes. Since arriving, he has participated in discussions on all current TUFFP experimental research projects and has also designed significant changes in TUFFP's pipe flow viscometer flow loop in anticipation of future contract research with this facility.



BDM/TU Partnership Should Benefit TUFFP

BDM Inc. was selected by the U.S. Department of Energy for a five-year managing and operating contract for the National Oil and Related Programs. Although currently in the contract negotiation stage, BDM Oklahoma, Inc. is scheduled to take over the management of the NORP in mid-October. Included in this contact will be the management of the NIPER facility in Bartlesville, Oklahoma.

A significant part of the BDM contract will be a partnership with The University of Tulsa in which TU will serve as a sole subcontractor to BDM. This arrangement could result in research consortia such as TUFFP having an opportunity to leverage its membership income through cost sharing research contracts with DOE. The potential for this relationship will become more clear during the next year.

BHRG Conference in France a BIG Success!

An exciting array of technical papers on the subject of multiphase flow in pipes was presented at the BHRG 6th International Conference on Multiphase Production in Cannes, France, on June 16 - 18, 1993. Approximately 130 people from virtually every continent gathered together to hear 26 technical papers on experimental investigations, analysis of slug flow, flow modeling, multiphase metering, and multiphase boosting. Although TUFFP had no papers at the conference, TUFFP was a co-sponsor of the event, and Dr. Brill served both as a corresponding member and as a session chairman.

TUFFP Benefits from Several Donations

Once again, it is a pleasure to announce significant donations from several companies during 1993. Most of these donations have been to provide all or part of equipment items needed for the new two-phase downflow test facility. NATCO donated a 36" x 15' horizontal separator for use in this test facility, while Invalco and Murphy Switch Company donated the controls for maintaining pressure and liquid level in the separator. Micro Motion provided a 50 percent reduction in cost for the purchase of equipment to meter both the liquid and gas phases. Morris Dundee donated a Wild Heerbrugg Theodolite T3 to accurately measure inclination angles for the downflow test facility. Finally, Validyne, Inc. provided a 50 percent reduction for the purchase of several pressure transducers to be used in the downflow test facility, the 1400 ft long pipeline, and a new horizontal well test facility.

ARCO Provides Horizontal Well Data



Following the TUFFP Advisory Board meeting in May, ARCO's representative delivered data to TUFFP on several horizontal wells from the Prudhoe Bay field of Alaska. Preliminary analysis of the data is underway by Dr. Sarica. At this time, it is not clear what type of analysis will be possible or whether the analysis should be performed by a graduate student or by one of the post doctoral Research Associates. A decision will be made later this year on whether the data can provide a basis for establishing a horizontal well data bank.

TUFFP Short Course - Another BIG Success!

Once again, a very successful short course on Two-Phase Flow in Pipes was held May 17 - 21, 1993, in Tulsa, Oklahoma. The course was attended by 28 engineers and scientists, including 24 from 11 TUFFP member companies and four from four non-member companies. Income from the course was sufficient to pay all expenses incurred. A tentative date of May 23 - 27, 1994, has been established for the next TUFFP short course.

TUFFP Membership Remains Stable

At this time, it appears that TUFFP could experience a slight growth in membership for 1994. Verbal or written confirmations of interest in membership have been received from AGIP and Baker Jardine and Associates. No existing members have indicated that they plan to cancel their membership for 1994. Thus, we anticipate entering 1994 with at least 31 member companies. A list of 1993 members appears on a following page.

TUFFP Eliminates Proprietary Clause for Membership

The University of Tulsa's Administration has ruled that all research consortia like TUFFP must remove any clauses from contracts and Letters of Agreement pertaining to maintaining research results as proprietary information. Proprietary clauses are being attacked by the United States Internal Revenue Service as being improper for non-profit, tax exempt institutions such as The University of Tulsa. In reality, for the past 20 years, TUFFP has considered research projects as proprietary only when TUFFP paid all costs pertaining to the project. Only a small fraction of TUFFP completed reports have been considered proprietary during this period, so removing the proprietary clause is of little consequence. Computer programs and experimental data generated by TUFFP research projects are seldom included in Ph.D. Dissertations and M.S. Theses. Rather, this information has been distributed periodically on magnetic tapes or floppy disks to member companies. This practice will continue and if non-member companies request copies of this information, costs will be imposed that are comparable to the TUFFP annual membership fee.

A revised Letter of Agreement is being prepared by the university's Office of Research and General Counsel and a draft will be submitted to member companies later this year.

TUFFP Hosting Multiphase Flow/Paraffin Deposition JIP Planning Session

TUFFP has been contacted by a group of oil companies that are interested in considering a joint industry project to investigate the effect of flow regime on wax deposition rates. A question to determine the relative interest of other TUFFP member companies in such a project is included in the Summer 1993 Questionnaire. In addition, tentative plans are to have a meeting of possible participants immediately following the TUFFP Advisory Board meeting in November. The meeting will be held on either Thursday or Friday, November 18 or 19, 1993, depending upon whether some of the interested parties would also be attending the TUALP meeting on November 18.

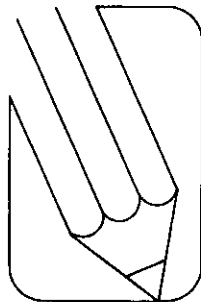
TUFFP Increases Annual Membership Fee for 1994

TUFFP entered 1993 with a reserve fund balance of \$161,334. Projected expenditures for 1993 will erode approximately two-thirds of this amount with most of these expenditures being allocated to the construction of a new two-phase downflow test facility and modification of the deviated well facility for safety and environmental reasons. As announced at the May 1993 Advisory Board meeting, this will result in the need to increase membership fees for 1994 to \$24,000. The increase will permit us to bring all experimental test facilities into compliance with safety and environmental standards and will also provide funds to modify an existing test facility in preparation for conducting research on oil-water flow through pipes.

At the present time, five member companies have not yet paid their membership fees for 1993. However, all have been contacted and payment is anticipated before the end of the year. Invoices for 1994 membership fees will be sent to members in mid-October to accommodate those companies who prefer to pay 1994 membership fees from their 1993 budgets.

1993 TUFFP Questionnaire

The 1993 TUFFP Questionnaire was distributed to the official Advisory Board Representative for each member company with this newsletter. Members were asked to express their relative interest on existing and possible future research projects. A request was made that the questionnaire be returned by October 4, 1993. Results will be tabulated and summarized in the November Advisory Board meeting brochure.



TUFFP/SUPRI-HW Membership Exchange Probable

Discussions continue with the Stanford University Productivity and Injectivity of Horizontal Wells (SUPRI-HW) Research Consortium for some type of membership exchange agreement. Dr. Brill plans to represent TUFFP at the October 7-8, 1993, progress meeting for SUPRI-HW in Palo Alto, California. We anticipate having a representative from Stanford University also attending the TUFFP Advisory Board meeting on November 17, 1993. Following these initial information exchange attempts, a decision will be made on how best to proceed.

Advisory Board Meetings Scheduled



The next two Advisory Board meetings will be held on November 16 - 17, 1993 and May 18 - 19, 1994. Please note that the May meeting is one week later than in past years.

The November meeting will be held at the Doubletree Hotel at Warren Place in Tulsa, Oklahoma. The May meeting will probably be held at the same hotel. Requests for information forms will be mailed to member companies approximately six weeks prior to each meeting to help determine attendance. The forms will be accompanied by information on hotel reservations and travel to and from the airport.

The November Advisory Board meeting will begin at 8:30 a.m. on Wednesday, November 17, 1993, and will adjourn at 4:30 p.m. A pre-meeting cocktail party will be held on the 19th floor of the adjacent Two Warren Place building from 6:00 - 8:00 p.m. on Tuesday, November 16, 1993. A tour of TUFFP test facilities will also be held on Tuesday afternoon from 3:00 - 4:30 p.m.

The above meeting dates were selected to accommodate persons who attend Advisory Board meetings of other cooperative research programs at The University of Tulsa. Following is a summary of these for November 1993.

Erosion/Corrosion	November 15
TUPREP	November 16
TUDRP	November 16
TUFFP	November 17
TUALP	November 18

TUFFP Advisory Board meeting brochures will be mailed to all members prior to the meeting. The brochures will contain sufficient information to help each attendee to actively participate in discussions on current and future research projects, financial matters, and operating procedures. Brochures containing slide copy for all presentations will be distributed at the meeting but will not be mailed to members.

TUFFP Participates in Several Technical Conferences

Papers based on TUFFP research have been submitted to various technical meetings since the last newsletter. In addition, TUFFP personnel are involved in planning for several conferences that will include sessions on multiphase flow through pipes. Following is a summary of these activities.

- Dr. Brill served as a corresponding member for the BHRG 6th International Conference on Multiphase Production held in Cannes, France, June 16 - 18, 1993. He also served as a session chairman at the conference.
- "Hilly Terrain Effects on Slug Flow Characteristics," G. Zheng, J. P. Brill, and O. Shoham, accepted for the SPE Annual Technical Conference and Exhibition, October 3 - 6, 1993, Houston, Texas.
- "Pigging Dynamics in Two-Phase Pipelines - Experiment and Modeling," K. Minami and O. Shoham, accepted for the SPE Annual Technical Conference and Exhibition, October 3 - 6, 1993, Houston, Texas.
- "PCB Migration in Natural Gas Pipelines," J. P. Brill, M. A. Adewumi, S. Tian, X. Cai, C. Sarica, and N. Nor-Azian, accepted for 1993 PSIG meeting, October 14 - 15, 1993, Pittsburgh, Pennsylvania.
- Dr. Brill will participate in a panel discussion dealing with multiphase flow through pipes as a part of the API Gas Lift Workshop held in conjunction with the ASME 17th Annual Energy Sources Technology Conference and Exhibition, January 25 - 26, 1994, New Orleans, Louisiana.
- Dr. Brill serves as Chairman of the Steering Committee for the joint University of Tulsa/SPE Centennial Petroleum Engineering Symposium, August 29 - 31, 1994, Tulsa, Oklahoma.
- Dr. Brill serves on the organizing committee for a BHRG Conference on Multiphase Production scheduled for Banff Springs, Canada, September 5 - 7, 1994.

1993 TUFFP Members

Amoco Production Company
 Arabian Oil Co., Ltd.
 ARCO Oil and Gas Company
 British Gas Corporation
 BP Exploration
 Chevron Petroleum Technology Company
 Chiyoda
 Conoco, Inc.
 ECOPETROL/Instituto Colombiano del Petroleo
 Elf Aquitaine
 Exxon Production Research Company
 Institut Francais du Petrole
 Institute of Oil & Gas Production Technology
 Oil & Natural Gas Commission
 Instituto Mexicano Del Petroleo
 INTEVEP
 JGC Corporation
 Japan National Oil Corporation
 Marathon Oil Company
 Mobil Research and Development Corporation
 NKK Corporation
 Norsk Hydro
 Pertamina
 Petrobras
 Petronas
 Phillips Petroleum Company
 Saudi Arabian Oil Company
 Shell Internationale Petroleum MIJ B.V.
 Simulation Sciences
 Texaco
 TOTAL
 UNOCAL

Calendar for Two-Phase Flow Technical Meetings

1993

October 3-6	SPE Annual Technical Conference and Exhibition	Houston, Texas
October 14-15	PSIG Meeting	Pittsburgh, Pennsylvania
November 17	TUFFP Advisory Board Meeting	Tulsa, Oklahoma
November 18	TUALP Advisory Board Meeting	Tulsa, Oklahoma
November 19	Planning Meeting for Joint Industry Program on Multiphase Flow/Paraffin Deposition	Tulsa, Oklahoma

1994

January 23-26	ASME 17th Annual Energy-Sources Technology Conference and Exhibition	New Orleans, Louisiana
August 29-31	The University of Tulsa/Society of Petroleum Engineers Centennial Petroleum Engineering Technical Symposium	Tulsa, Oklahoma
September 5-7	BHRG/TUFFP Conference on Multiphase Production	Banff Springs, Canada
September 19-21	3rd International Symposium on Multiphase Flow and Heat Transfer	Xi'an, China

Research Progress

Reports



Annular Flow in Extended Reach Directional Wells

The objective of this project is to investigate, experimentally and theoretically, annular flow in extended reach directional wells. The entire range of inclination angles, from horizontal to vertical upward, will be studied. A mechanistic model for annular flow will be developed and tested against laboratory data and, if possible, field data.

The design of the two inch diameter state-of-the-art conductance multi-probe instrument has been completed. This instrument can hold up to eight conductance probes symmetrically distributed around the pipe periphery. This design allows a very flexible operation of some or of all the probes simultaneously. However, after preliminary runs and calibrations, it was found that an in situ dynamic calibration will be required in order to account for conductivity reduction due to the agitation between the gas and liquid interface. In addition, a conductivity cell was installed to monitor and account for conductivity changes due to temperature and solids concentration in tap water.

Efforts are underway to acquire preliminary data for vertical annular flow utilizing a small scale facility located in the Model Lab building. Simultaneously, the large outdoor flow loop has been examined carefully for safety and maintenance concerns, and maintenance of this facility is underway. We hope to present preliminary results and performance of the conductance probes at the November Advisory Board meeting.



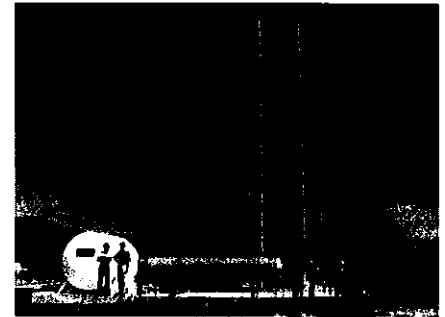
Downward Two-Phase Flow in Inclined Pipes

The objective of this project is to study, experimentally and theoretically, two-phase flow in downward inclined pipes. The initial part of the project will concentrate on slug flow and will include measurements of liquid holdup, pressure gradient and translational slug velocity for

different operating conditions. All inclination angles from horizontal to vertical downward will be considered.

The first goal for this research project is to design and construct a test facility to acquire

necessary data and develop a preliminary model for subsequent evaluation with experimental data. Construction of the support structure and design of the test facility have been completed. Components of the fluid handling system, consisting of separator, storage tank, pump, and meters are in place and piping of the system is underway. Design of the test section has been completed and instrumentation for data acquisition has been selected. New improved capacitance sensors for measuring the liquid holdup are nearing completion. Efforts have been made to develop the data acquisition program using LabVIEW software. Preliminary runs are expected to start at the end of August and data and modeling results will be presented at the November Advisory Board meeting.



Flow Behavior in Horizontal Wells

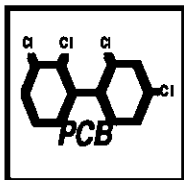


Horizontal wells can have very complex flow geometries, in part due to interaction between the main flow stream and the influxes along the wellbore, and also due to completion type.

A survey of the literature reveals that no experiments have been conducted for relatively low Reynolds numbers, including the laminar flow region, in perforated horizontal pipes with fluid injection. The objective of this project is to investigate, experimentally and theoretically, flow behavior in horizontal wells. The effect of influxes on horizontal well flow at practical influx to main flow ratios will be investigated in both laminar and turbulent flow regimes for three different pipe perforation densities.

Design of the test facility is nearly finished. Test pipe, test fluids, and pump and measurement devices such as flow meters and pressure transducers have been selected.

The possible influx to main flow ratios at different Reynolds numbers have been determined from some field examples and for a uniform influx assumption. At present, the flow behavior in horizontal wells is also being investigated using the principles of conservation of mass, momentum, and energy.

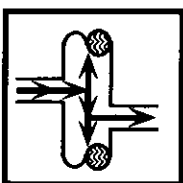


GRI Liquid Transport Tests

The objective of this study is to investigate, experimentally and possibly theoretically, two-phase flow in pipelines with very low liquid holdup. Information gained will help understand the migration of PCBs in natural gas transmission pipelines, and will help identify more extensive tests to be conducted during the period 1994 - 1996.

Modification of the existing TUFFP 1378-foot-long, 3.068 inch-diameter flow loop has been completed, including new metering runs, feed lines, measuring stations, and valley sections. New data acquisition hardware has been installed and new LabVIEW programs have been written. With ideas gained from simulation program predictions, test runs have been designed, and instrumentation (such as pressure transducers/diaphragms, turbine meter) covering appropriate test ranges has been selected.

Efforts underway are final calibration of all the instruments to be used in the experiments. Preliminary test runs will be carried out in August. Initial results will be presented at the November Advisory Board meeting.



Two-Phase Flow Splitting at a Tee Junction with an Upward Inclined Side Arm

An experimental and theoretical investigation of two-phase flow splitting at a regular, horizontal, tee junction with an inclined side arm was performed with the stratified wavy flow pattern at the tee inlet. An existing test facility was modified to allow data to be obtained for the entire range of side arm inclination angles, including upward vertical, upward inclined, horizontal, downward inclined, and downward vertical positions. A new data acquisition system was used to ensure that high quality experimental

data were obtained.

Splitting data were obtained for a range of stratified wavy flow conditions at the tee inlet, and for different inclination angles. The results show different trends from the published horizontal side arm data. The data reveal that for low gas take-off into the branch (or side arm), the gravity forces are dominant. This results in less liquid being diverted into the branch for the upward inclination angles, and more liquid being diverted for the downward angles as compared to the horizontal side arm data. At higher gas split ratios into the branch, the gas drag force on the liquid appears to play a very significant role, overcoming the gravity effects.

A model has been developed that describes the preferential liquid movement for the side arm in upward inclined positions. The model consists of two distinct parts. The first is the branch gas threshold, which is the minimum amount of inlet gas that has to be diverted into the side arm in order to initiate liquid flow into the side arm. Once liquid has started flowing into the side arm, another model was developed that predicts the liquid splitting ratio for a given gas split.

The proposed splitting model for upward inclination angles was tested against the experimental data obtained in the present study and reasonable agreement was found between the proposed model and the data.

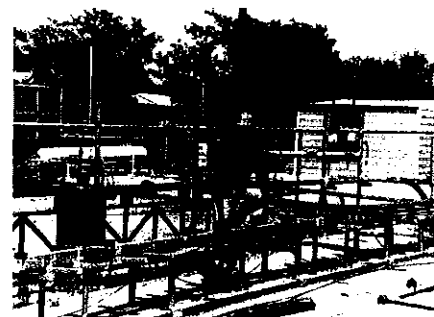


Experimental and Theoretical Investigation of Non-Emulsified Oil-Water Flow Patterns in Pipes

Predicting the hydrodynamics of oil-water flow in pipelines is a difficult and unsolved problem. Most of the research conducted in two-phase flow has been related to gas-liquid systems.

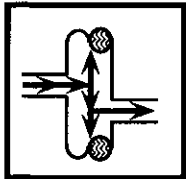
However, these studies can not readily be applied to liquid-liquid systems.

The objective of this study is to investigate, experimentally and theoretically, non-emulsified oil-water flow patterns in pipes. Experiments will be carried out to investigate the characteristics of the flow patterns for the entire range of inclination angles, from horizontal to vertical, for one set of fluid properties and two-inch-diameter transparent pipe. The mechanistic modeling approach will be used



to model the oil-water flow pattern transitions.

Modifications of the experimental test facility are being planned. This work has concentrated on the design and equipment selection for the water handling facilities, oil-water separator, and heat exchangers. Well-known, gas-liquid flow pattern models are carefully being studied and compared with the small amount of published oil-water flow data.

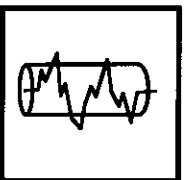


Two-Phase Flow Splitting at a Tee Junction with a Downward Inclined Branch Arm

The objective of this study is to investigate, experimentally and theoretically, two-phase splitting under stratified wavy flow conditions at a horizontal tee-junction with a downward inclined branch arm.

Experimental data have been acquired with the side arm inclined downward at inclination angles of 0° , 5° , 10° , 25° , 40° , and 60° from horizontal. The data reveal that gravity forces have a significant effect on the flow splitting. This results in more liquid flowing into the branch arm, as compared to the case in which the side arm was horizontal. All the liquid was found to be diverted into the branch arm when the branch arm inclination was increased to 60° .

A mechanistic model has been developed for the prediction of the splitting phenomenon for both the horizontal and the downward orientations of the side arm. The model is based on the momentum equations applied for the separation streamlines of the gas phase and the liquid phase. Excellent agreement is observed between the prediction of the model and the data acquired for all the cases.



Transient Two-Phase Flow in Horizontal Pipes

The objective of this study is to experimentally investigate transient two-phase flow phenomena in horizontal pipes and compare the acquired data with predictions of available transient two-phase flow simulators such as OLGA, PLAC, TACITE, and a TUFFP simplified transient code.

A series of different types of transient tests have been designed by using the TUFFP simplified simulator and

PLAC results provided by Amoco Production Company. These experimental tests include gas and liquid flow rate changes, pipeline start-up and shut-down, line rupture, and pipeline depressurization. Also considered will be terrain induced transients caused by liquid accumulation in a valley. The data will comprise measurements of liquid holdup, pressure drop, outlet liquid flow rate, and visualization of flow patterns.

Final modifications and instrumentation of the existing 1378-foot-long, 3.068-inch-diameter, experimental test facility will be completed in early August 1993. We hope to present preliminary test results at the November Advisory Board meeting.

TUFFP

Executive Director:	James P. Brill
Staff Engineer:	Jerry F. Wilson
Research Associates:	Stefan Z. Miska Yehuda Taitel
Visting Scholars:	Fabrice Vigneron
Post Doctoral Research Associates:	Dennis Cai Tom Chen Cem Sarica
Administrative Secretary:	Linda Jones
Technicians:	C. Ingle T. Butler
Research Assistants:	R. Paz P. Roumazeilles J. Trallero J. Yang H. Yuan
Computer Resources Manager:	Yesenia Rincón
Part-time Employees:	Elizabeth Ahow Mario Ballesteros Ivan Hardy Johan Johan Robert Marcano

CON ALLEY

HP Workstation Upgrade

TUFFP has purchased a new Hewlett Packard/Apollo 9000 Series 700 Model 715-50 workstation and a Model 700/RX terminal. HP's generous upgrade policy and substantial educational discount made this purchase possible. The workstation has 32 MB of RAM, a DAT tape backup, and a one-gigabyte hard drive. The new workstation has the HP-Vue operating system and will be utilized as a server for the 700/RX terminal, thus effectively giving us two workstations. Available software includes FORTRAN and Interleaf and TU has site licenses for these software packages. We also anticipate utilizing the DAT tape for software distribution in the future.

Computer Network Expansion Study

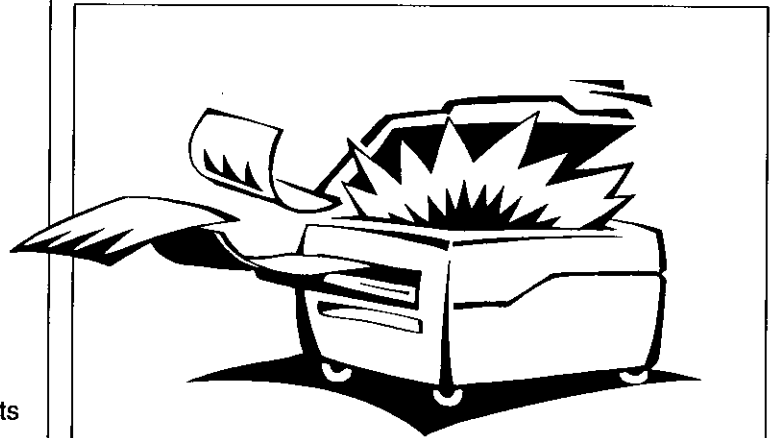
TUFFP's computer network master plan includes total conversion to an Ethernet system. We are investigating the cost of installing new network cables to data acquisition computers in the new downflow facility, the renovated deviated well facility, and to the technicians' offices. A router installed in the computer room would enable us to utilize existing data jacks in each office for the Ethernet system. The router would also provide connection to the main campus network. The increased speed of the Ethernet system over our Localtalk network would enhance transfers of data from outside facilities to the HP/Apollo workstations. Network improvements would also expand our E-Mail capabilities and enhance communications with the main campus and within TUFFP. We have asked the university administration to consider funding these network improvements since other campus elements have networks provided by the university.

TUFFP Training

Weekly seminars are being planned for this fall that cover a wide range of professional and technical subjects, including the following: presentation and instructional techniques; basic surveying measurement techniques; spill and containment procedures; construction; industrial and laboratory safety; contract formulation and administration; procurement procedures; value engineering; engineering contracts; computer generated network analysis (PERT and CPM); construction inspection and quality assurance techniques; contract negotiation; LabView instrumentation and software; sessions on various Macintosh software programs; and, sessions on UNIX and workstation usage. All instruction will stress practical and professional applications of the subjects. Various staff members and guest instructors will provide the instruction for these seminars.

Video Upgrade

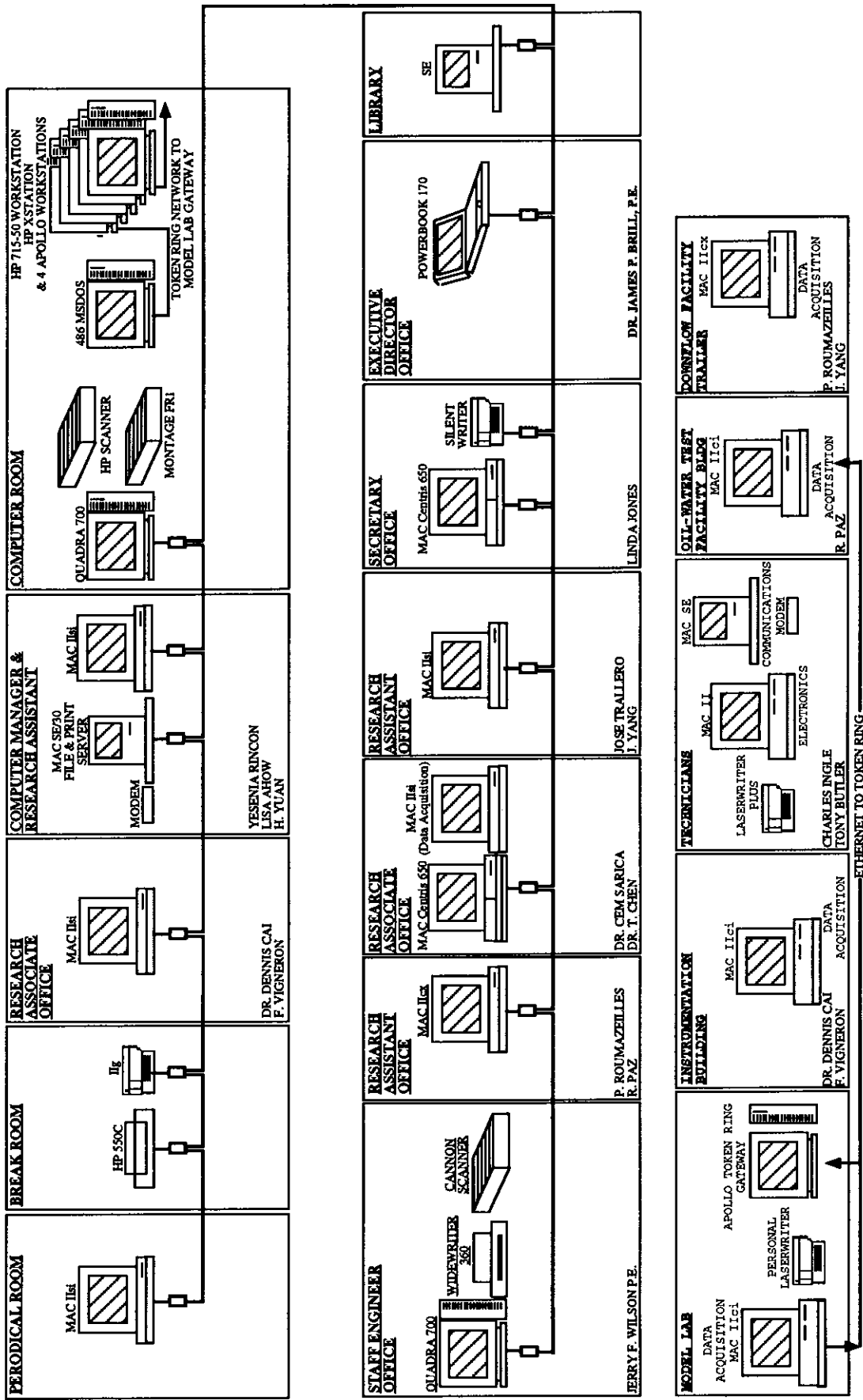
A new Hi-8 VCR and Sony 36" TV monitor in the conference room has given us improved video dubbing and instructional capabilities. We have also dubbed our old video tapes onto VHS format tapes and have donated the old 3/4" VCR to the university's audio/visual department in McFarlin Library. The Hi-8 VCR, used in conjunction with the high speed camera purchased last year, gives us the capability of obtaining very clear, stop-action videos of multiphase flow phenomena. The new video equipment is also being used effectively by all students and staff for training purposes. When Jerry Wilson attended the MacAcademy seminar last winter, he purchased training videos on the major software packages used by TUFFP. This video library is available for students and staff to check out for home or office viewing.



New Facilities Generate Computer Needs

Providing data acquisition capabilities for the new downflow facility and the remodeled deviated well facility required moving Macintosh IIfx and IIfx computers to those facilities, creating additional computer needs in TUFFP offices. In our continuing effort to keep up with new operating systems and larger software packages, we acquired two new Macintosh Centris 650 computers. One of these computers has a CD ROM to provide efficient searching on the network of SPE literature, a task that is vital to our research. The Centris 650s are 68040 chip, 25 megahertz machines, are much faster than our older computers, and have considerable expandability.

TUFFP COMPUTER NETWORK



TUFFP COMPUTER
LAYOUT DIAGRAM
FALL 1993

COLLEGE OF ENGINEERING AND APPLIED SCIENCES
PETROLEUM ENGINEERING DEPARTMENT



The University of Tulsa
Fluid Flow Projects
600 South College Avenue
Tulsa, Oklahoma 74104-3189

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